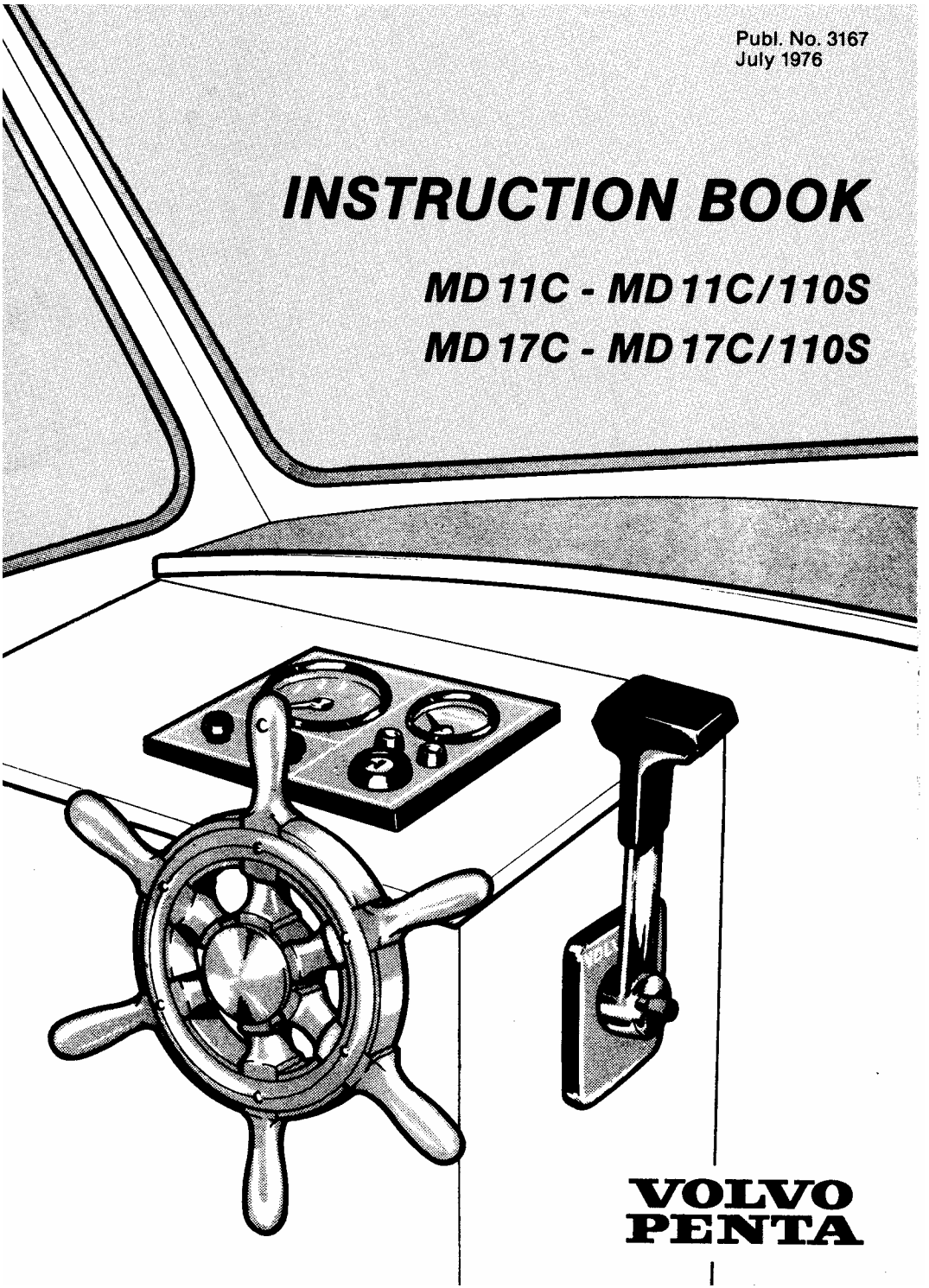
Publ. No. 3167
July 1976

INSTRUCTION BOOK

MD 11C - MD 11C/110S
MD 17C - MD 17C/110S



VOLVO PENTA

FOREWORD

Before you start your new Volvo Penta marine engine, you are advised to read through this instruction book carefully. It contains all the information you need to run and service your engine in the best possible way.

Volvo Penta has built up an extensive service organization with service workshops with specially trained personnel at your service.

Always contact your local Volvo Penta representative for advice and when in need of service and parts.

We are convinced that the demands on good running economy and top performance, which you have every right to expect of a quality product, will be met and that your engine will serve you faithfully on many pleasant cruises.

Warranty Certificate

A warranty certificate is supplied with each new engine. It contains the warranty conditions for the engine and should be studied carefully.

Included in the warranty certificate is a report card which is to be completed by the dealer or boat seller and forwarded to Volvo Penta.

However, if our warranty is to apply, it is an absolute condition that the measures given in the "Check and Service Scheme" are carried out and that your engine and equipment are looked after according to the instructions in this book. When in doubt, always get in touch with an authorized Volvo Penta dealer.

In all correspondence with your dealer and when ordering parts, always state the type and designation and serial number of the engine and reverse gear or drive (see starboard side of engine).

Make certain that the engine's specification coincides with what is described in this instruction book**.**

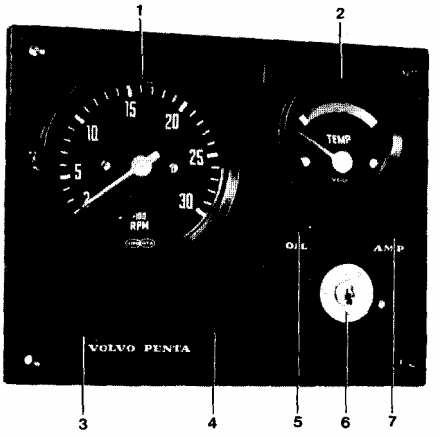
AB VOLVO PENTA
Technical Information

CONTENTS

Instruments and controls 2
General information 3-4
Running instructions 5-7
Starting the engine 5
Running 6
Shutdown procedure 6
Technical description 8-10
Checks and service scheme 11
Checks and service 12-25
Daily checks before starting 12
Checks every 14 days 12-13
Service every 50 hours of operation 13-14
Service every 100 hours of operation 15-21
Service when laying up and launching 22-25
Fault tracing scheme 26
Technical data 27-28
Wiring diagram 29
On board data 30
Engine component guide 31-34
S-drive 110S 35-37
Index, alphabetical order 38

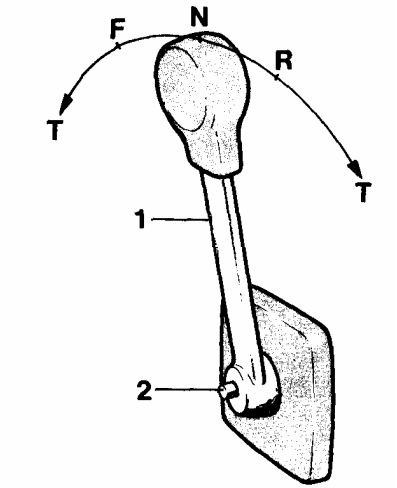
INSTRUMENTS AND CONTROLS

INSTRUMENT PANEL



1. **Rev counter**
2. **Temperature meter for cooling water**
   Green scale - normal emperature.
3. **Switch. for extra lighting**
4. **Instrument panel illumination**
5. **Warning lamp "low oil pressure".**
If lit - stop engine, oil pressure insufficient.
6 **Key switch**
7. **Warning lamp "No battery charging"**
If lit - no charging.

CONTROL SYSTEM



Volvo Penta Single Control System
For side mounting

1. Control lever
2. Disengaging button

Push in the button when the control lever is in neutral and move the lever a bit forwards. Release button. The lever is now used only for engine speed control. To use the lever for both engine speed control and gear charging, push in the button and pull back the lever to neutral.

N=Neutral position
F=Control lever in position for running "forward".
R=Control lever in position for running "reverse"
T= Engine speed control

GENERAL INFORMATION

Important information on the function of your engine.

FUEL Use diesel fuel oil of quality "Autodiesel". Poorer fuel quality can cause interruptions in operation.

LUBRICATING OIL Use only oil of quality CD (DS) according to the API system. Volvo Penta oil for diesel engines can be used with advantage since it meets these quality demands. See under "Technical Data" concerning the viscosity if any other oil is used.

RUNNING IN A new marine engine must be run-in with due care during the first 20 hours of operation. If full output is taken out during this time, it should only be done for short periods.
Oil change. Change the engine oil and oil filter after the engine has been run for 20 hours. See further under "Checks and Service".

ENGINE SPEED Max speed: MD 11 C, MD 1 7C 41.7 rev/sec (2500 rpm)

For choice of correct propeller, refer to the Volvo Penta propeller diagram. Check the engine speed with normal load in the boat. In order to utilize the maximum performance of the engine, an engine speed as high as possible should be chosen but not, however, higher than 41.7 rev/sec (2500 rpm).

Note: When the boat has been in the water for some time, the speed and max rpm can drop due to marine growth on the hull. Prevent marine growth by painting the bottom of the boat with anti-fouling paint. See under "Measures taken when launching".

GENERAL INFORMATION

SAFETY EQUIPMENT

Irrespective of whether the boat is being used for long cruises or short bathing trips, the boat should be equipped with the safety equipment listed below. It can, of course, be supplemented further according to personal tastes. Investigate at regular intervals to ensure that there is safety equipment on board and that it is in working order.

LIFE JACKETS for all on board

FIRE EXTINGUISHER, approved, at least one and installed where it is easy to get at.

DISTRESS ROCKETS and matches. Packed watertight. **FIRST AID BOX**

TOOLS suitable for the equipment on board **ON BOARD KIT** containing, e.g. impeller, etc. **ANCHOR** with line.

RADAR REFLECTOR

RADIO for listening to e.g. weather reports. **COMPASS** which is deviated.

BOAT HOOK and PADDLE

MOORING ROPES

FOGHORN and whistle **FLOATING ANCHOR TORCH**

PREPARATIONS BEFORE STARTING

Make sure that:

There is no **FUEL LEAKAGE**

There is no **WATER LEAKAGE** from the engine and hull There is no **OIL LEAKAGE**

There is no **SMELL OF LIP GAS** in the deep cavities in the boat or elsewhere The **OIL LEVEL** is correct.

There is enough **FUEL** for the planned voyage.

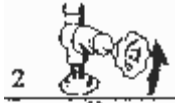
The proper **NAUTICAL CHARTS** are on board for the planned voyage.

If there are persons on board who have never been on the boat before, inform them how the boat functions and where the Life Jackets and Fire Extinguisher are located. Also inform them of anything more you think necessary from a safety point of view. Should anything unexpected happen during the voyage, it is often too late to tell those on board how safety equipment works.

RUNNING INSTRUCTIONS

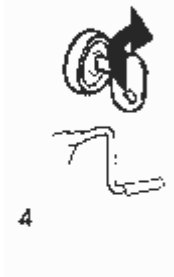
START THE ENGINE

Switch on the main switch. Start the engine room fan (if fitted) and let it run several minutes before starting the engine.

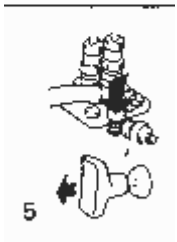


Open the cock for cooling water intake.

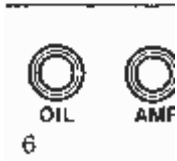
Disengage the engine speed control from the gear changing as follows: Move the control lever to neutral, push in the red disengaging button, and move the lever slightly forwards. Release the button. The lever can now only operate the engine speed. Check to make sure that the stop control is pushed in.



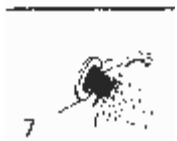
Turn the key switch one stage to the right. The warning lamps for battery charging and oil pressure should now go on. If there is an alarm system fitted, the siren should sound. Push in and turn the key further to the right to start the engine. Release the key when the engine starts.
Handstarter (standard MID11C, extra MD17). When the engine is started with the starting crank, the de-compression handles on the rocker arm covers should be raised upright (see 16, pages 31-32). Return the de-compression handles for running when the cranking has got the engine up in speed.



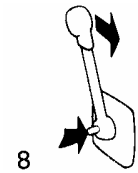
Cold weather.
MD11: Starting is facilitated if the cold-start control is pushed down, or the cold-start control (accessory) is pulled out. The cold-start button returns automatically. The cold start control must be pushed in after the engine
has started.
MD 17: The engine has a built-in automatic cold-start device.



Check immediately after starting that the warning lamps for the oil pressure and battery charging are not lit. If any of the lamps are alight, the engine must be stopped immediately and the cause investigated. If an alarm system is fitted (accessory) the siren should be silent.



Run the engine warm at rapid idle. Check to make sure that the cooling water flows out with the exhaust gases. Note. The key-switch should always be switched on as long as the engine is running to ensure that there is battery charging.

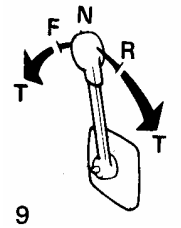


8

Reduce to idle and check that the engine is running smoothly.

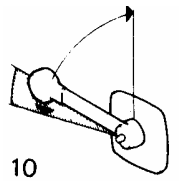
Engage the control lever for gear-charging as follows:
Push in the red disengaging button when the lever is in neutral. Release the button. The control lever can now be used both for gear changing and engine speed.

RUNNING



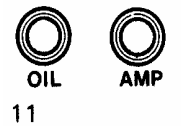
9

The single lever control has both engine speed and manoeuvering functions.
F = Forward
R = Reverse
N = Neutral
T = Engine speed control



10

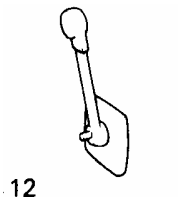
To achieve good running economy, the engine should not be run at max speed for a longer period.



11

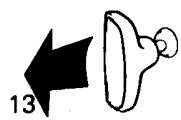
Check during running that the temp meter, and also the lamps for battery charging and low oil pressure are not lit. If an alarm system is fitted and the siren sounds, - **Stop the engine immediately** and investigate the cause.

SHUTDOWN PROCEDURE



12

Before shutdown the engine should be allowed to idle for a few minutes with the control lever in neutral.



13

Stop the engine by pulling the stop control when the engine is idling. Then turn back the key switch to the initial position.

RUNNING INSTRUCTIONS

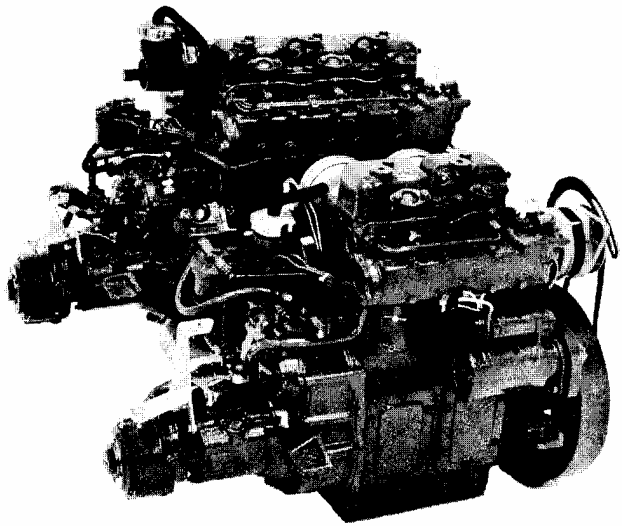
14

Switch off the main switch. NOTE. This switch must never be switched off before engine has stopped. Close the fuel and cooling water cocks if the boat is not going to be used for some time. Check for leakage before leaving the boat.

15 

In cold weather and whenever there is a risk of freezing, the cooling water must be drained from the engine and reverse gear. (See pos. 14 and 10, pages 31-32).

TECHNICAL DESCRIPTION



MD 11 C and MD 1 7C, are 2 respectively 3 cylinder, 4 stroke marine diesel engines, with direct injection and sea water cooling.

ENGINE ASSEMBLY

The crank case, cylinders and cylinder heads are made of cast iron. The engines have replaceable cylinder liners and overhead valves.

LUBRICATION SYSTEM

The lubrication system has a full-flow oil filter which cleans the oil before it reaches the lubrication points. The oil pump has a relief valve which prevents the oil pressure from becoming excessive.

ELECTRICAL SYSTEM

The engine has a starter motor and an alternator with a built-in rectifier. Voltage regulation is done by a transistorized regulator mounted on the alternator. The alternator can charge two batteries, independent of other, if a charging distributor (accessory) is fitted to the alternator. A main fuse, which can easily be reconnected, is fixed to the engine. It protects the electrical system from damage in the event of overloading. The wiring diagrams for the engine and instrument panel are shown on page 29.

TECHNICAL DESCRIPTION

FUEL SYSTEM

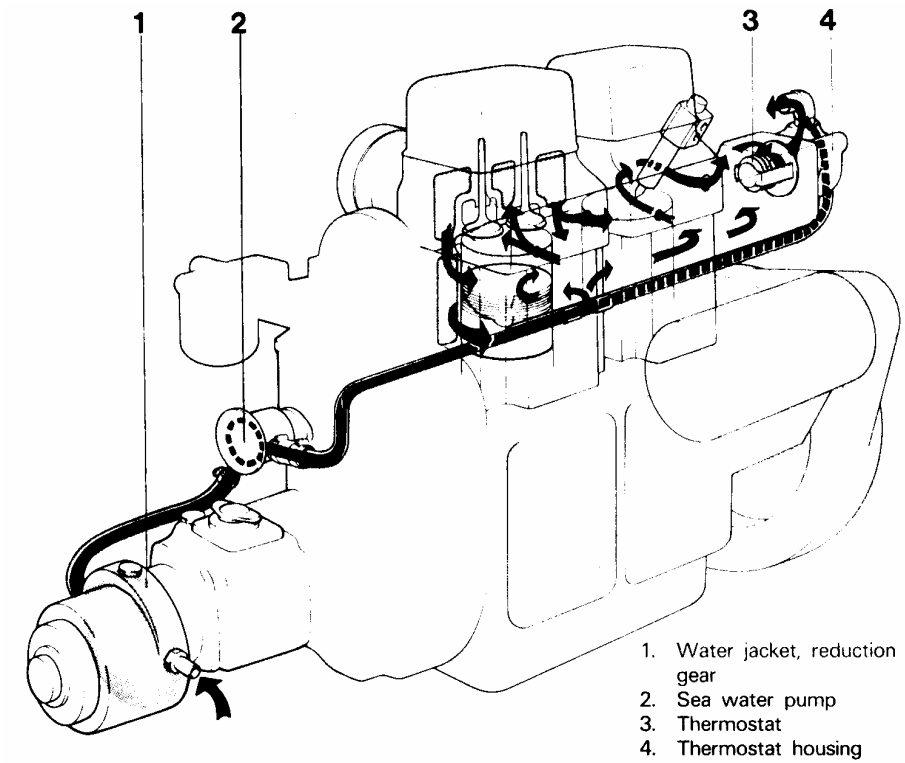
The fuel system has a feed pump with a fine filter, fuel filter with a fine filter insert, injection pump and injectors. The feed pump is of the membrane type and has a hand primer lever. There is a built-in cold start device. On the MD11C it is controlled manually and on the MD17C it is operated automatically.

COOLING SYSTEM

The engine is cooled by sea water. The cooling system has a sea water pump and a water distribution housing with a thermostat,

The sea water pump has an impeller made of neoprene rubber, which is driven via a rubber flange from the camshaft.

The thermostat in the water distribution housing regulates the water flow, so that water is always flowing in the exhaust manifold and out in the exhaust elbow, regardless of whether the engine is cold or hot.



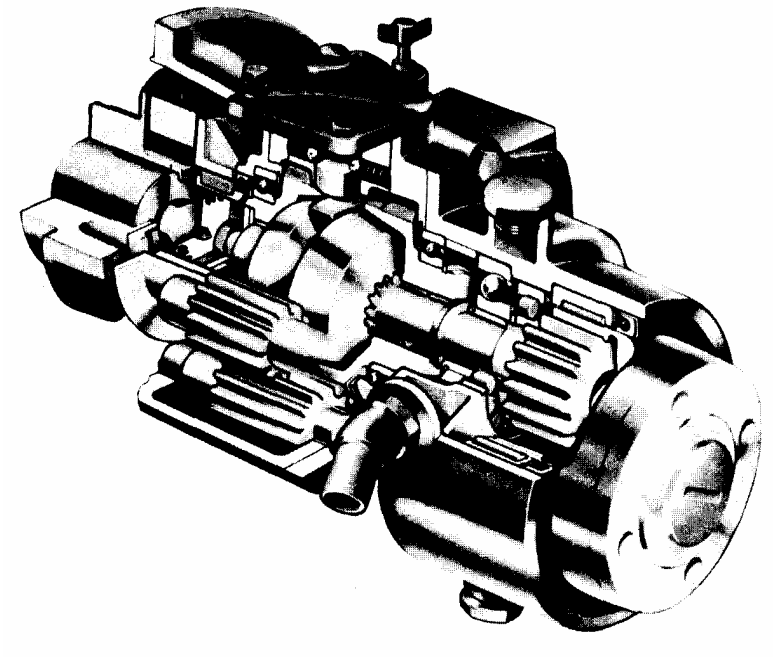
1. Water jacket, reduction gear
2. Sea water pump
3. Thermostat
4. Thermostat housing

TECHNICAL DESCRIPTION

REVERSE GEAR

The Volvo Penta reverse gear, type Mono Shift, has a reduction ratio of 1.9 1: 1. The reduction gear is integrally built with the reverse gear. The power transmission from the engine to the reverse gear is via a rubber flange.

For operating "Forward" and "Reverse" the Volvo Penta patented cone clutch 'is used, which ensures smooth and quiet engagement. Very small forces are required to operate the reverse gear.



Reverse Gear type Mono Shift (MSB).

CHECKS AND SERVICE SCHEME

Checks and service should be carried out regularly in accordance with the intervals given below. Let an authorized Volvo Penta Service Shop look after your engine.

CHECK DAILY BEFORE STARTING that

Page
The oil level in the engine is between the marks on the dipstick 12

CHECK EVERY 14 DAYS that

The oil level in the reserve gear is between the marks on the dipstick 12
The electrolyte level in the battery is correct 13
The belt tension is sufficient to prevent the alternator from slipping 13

SERVICE EVERY 50 HOURS OF OPERATION

Change the oil in the engine 13
Change the oil in the reverse gear 14
Check and adjust the valve clearance 14

SERVICE EVERY 100 HOURS OF OPERATION OR AT LEAST ONCE EACH SEASON

Change the oil filter 15
Clean the air filter 15
Check and change the pulley belt for alternator 16
Check-tighten the cylinder head bolts 16
Check the cooling system 16-17
Check the electrical system (fuses etc.) 17-19
Check the fuel system, filter, strainer, injector, venting 19-21

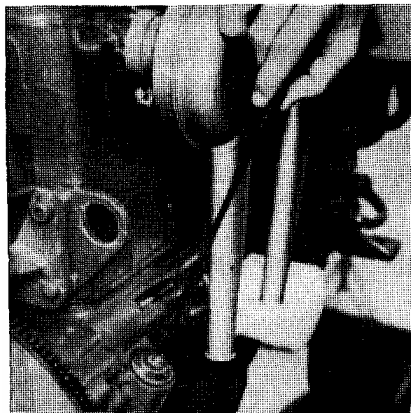
SERVICE WHEN LAYING-UP AND LAUNCHING THE BOAT

Inhibiting scheme I. To be carried out with boat in water 22
Inhibiting scheme II. To be carried out with boat on land 23
Service in connection with launching 24
Venting of fuel system 21

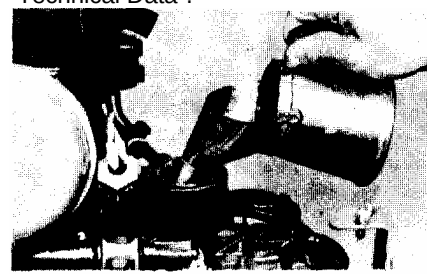
CHECKS AND SERVICE

CHECK DAILY BEFORE STARTING

OIL LEVEL IN ENGINE

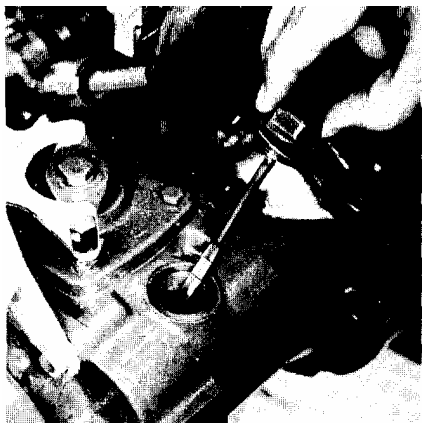


Each day before starting, check that the oil level is between the marks on the dipstick. Top up with oil if necessary, through the oil filler hole. NOTE. Do not top up above the max mark. MD11: Check that the dipstick is screwed down so that no leakage can occur. Concerning the choice of oil, see under "Technical Data".



CHECKS EVERY 14 days

OIL LEVEL IN REVERSE GEAR



Unscrew the dipstick, wipe it clean and insert it again without screewing it down. Pull up the dipstick and check the oil level, which should be between the marks. If necessary top up with oil. Do not top up above the Max mark.

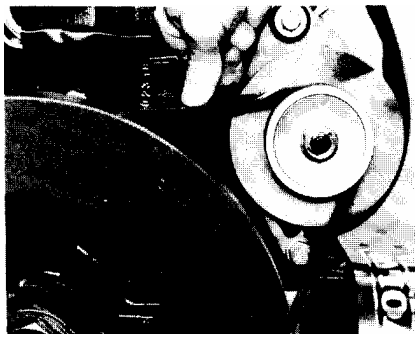
Screw down the dipstick again. Note that there is a sealing washer on the dipstick. Concerning choice of oil, see under "Technical Data".

CHECKS AND SERVICE

ELECTROLYTE LEVEL IN BATTERY

The level should be between 5-10 mm (3/16"-3/8") above the cell plates in the battery. If necessary top up with distilled water. NOTE. Observe great care when doing this, as the electrolyte is corrosive, and the gas which is formed is explosive.

BELT TENSION



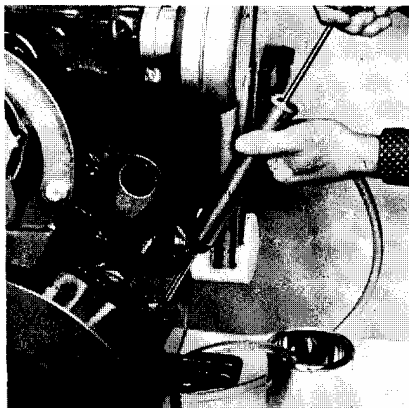
Correct belt tensioning is necessary for full alternator output. The belt should be so tensioned that it can be depressed 5 mm (3/16") with the thumb midway between the pulleys.

The belt can be tensioned after slackening the alternator mounting belts.

A well worn or cracked belt should be replaced.

SERVICE EVERY 50 HOURS OF OPERATION

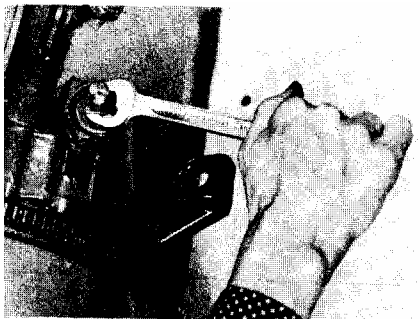
OIL CHANGE IN ENGINE



NOTE: Since the printing of the book an alteration has been made in the method of changing oil. In the case of the MD11C it has been indicated that the oil screen is to be removed. If the oil screen for the MD11C does not have a Wedged handle it must not be removed. Remove only the oil dipstick and push the suction tube through the hole. This procedure has to be followed also on earlier engines.

With a new or newly reconditioned engine, the oil should be changed for the first time after 20 hours of operation, and thereafter every 50 hours of operation. Run the engine warm. Suck up the oil with a pump through the dipstick hole.

CHECKS AND SERVICE

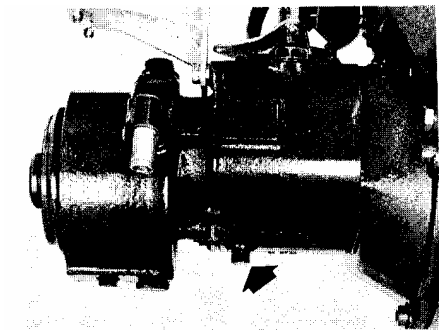


On the MD11C the plug together with the oil strainer must first be removed. NOTE. When removing the strainer the gasket must be checked. **Re-tighten well.**

Fill oil to correct level. Refer to "Technical Data" regarding choice of oil.

NOTE. The oil filter should also be changed at every other oil change.

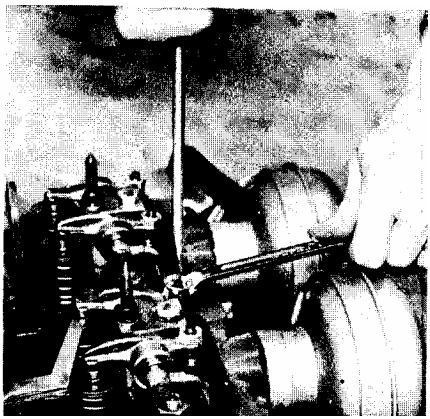
OIL CHANGE IN REVERSE GEAR



The oil can be drained from the reverse gear by removing the plug under it, or by sucking up the oil through the dipstick hole with the help of an oil scavenging pump.

Fill with oil through the filler hole to the correct level. NOTE. Do not fill above the Max mark on the dipstick. Regarding choice of oil, refer to "Technical Data".

VALVE CLEARANCE



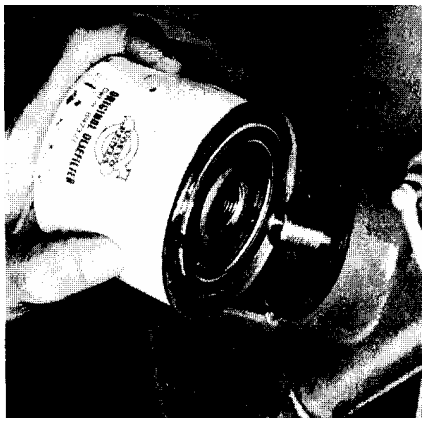
The valve clearance should be checked and adjusted by an authorized workshop. Refer to "Valves, Technical Data". When necessary, check and adjust the decompression device's action on the exhaust valve.

CHECKS AND SERVICE

SERVICE EVERY 100 HOURS OF OPERATION OR AT LEAST ONCE EACH SEASON

OIL FILTER

The oil filter should be replaced for the first time after 20 hours of operation during the running-in period and subsequently at every other oil change. Unscrew and discard the oil filter.

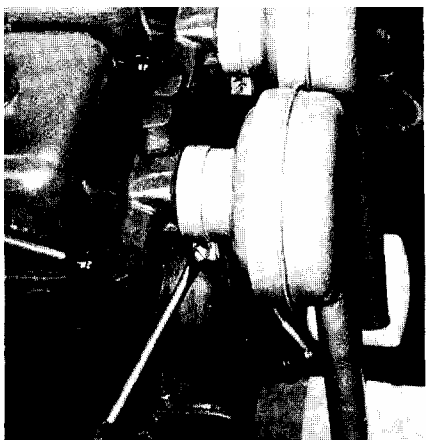


Coat the new oil filter's rubber seal with oil. Check the contact surface on the engine and screw in the **filter by hand** until it touches the contact surface. Turn the filter a further **half turn, not more.**

NOTE. Use only genuine oil filters.

Start the engine, run at idling and check that the oil pressure lamp goes out.
Check oil level and that there are no leaks from the oil filters contact surface.

CLEANING OF AIR FILTER



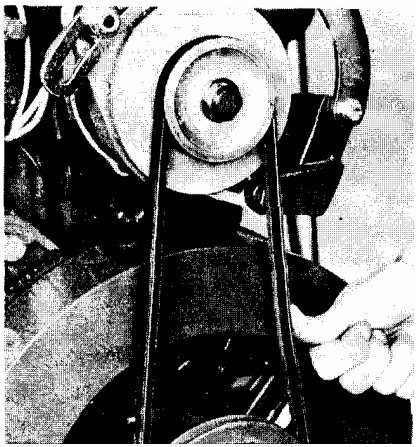
The air filter should be removed and cleaned after every 100 hour operation period or once per season. Loosen the clamps with a screwdriver and remove the filter.

Clean the filter with diesel fuel and blow it clean with a compressed air gun. Soak them in thin engine oil.

Let the engine oil drain and refit the filter.

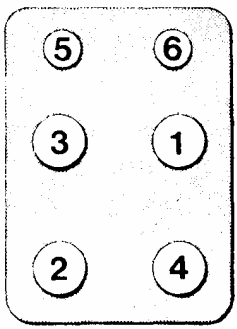
CHECKS AND SERVICE

CHECKING AND REPLACEMENT OF PULLEY BELT



Check the belt carefully, both for wear and cracks. Any sign of such, then the belt must be replaced. Loosen the alternator mounting bolts so that the belt can be removed. Dry the pulley grooves before fitting the new belt. Tension the belt so that the belt can only be pressed down 5 mm (3/16") between the pulleys. After a few hours running, recheck belt tensioning and adjust if necessary.

RETIGHTENING CYLINDER HEAD BOLTS



Retighten each bolt **with a torque wrench** before starting a new engine or an overhauled engine for the first time, and after 20 hours of operation. The valve clearance should always be checked after the bolts have been retightened. Sequence for tightening the bolts is shown in the figure opposite.

Torques:

Nos. 1, 2, 3 and 4 are torqued to 11 kpm (79 lbft)

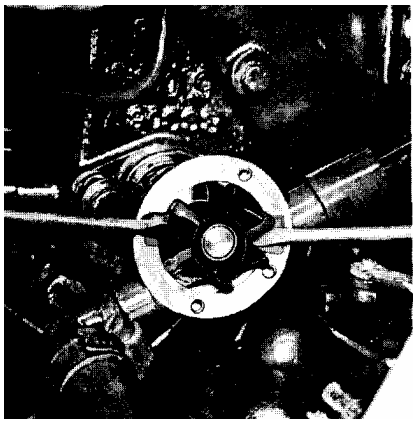
Nos. 5 and 6 are torqued to 4.5 kpm (32 lbft)

CHECKING OF COOLING SYSTEM

The cooling system is working normally when the temp gauge is registering within the green scale and the alarm (if fitted) is silent. Too high water temperature (red scale, siren is sounding) can be due to the following: blocked water intake, defective impeller or the flange in the sea water pump, faulty thermostat or temp sender. **Be observant for water ingress** when working with the cooling system.

CHECKS AND SERVICE

Checking and changing of the impeller

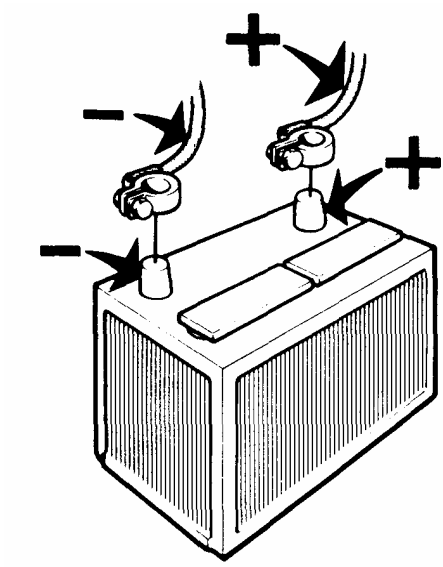


The impeller can be damaged by e.g. lack of water. Remove the cover on the sea water pump. Draw out the shaft enough so that the impeller's locking screw can be screwed out. Holding the shaft, draw off the impeller. If the impeller is damaged it must be changed.

Lock the impeller on the shaft with the locking screw.

The flange is defective if the impeller and the shaft can be rotated. A new flange can be fitted after the pump has been removed. Refit the cover with its gasket.

ELECTRICAL SYSTEM



Alternator

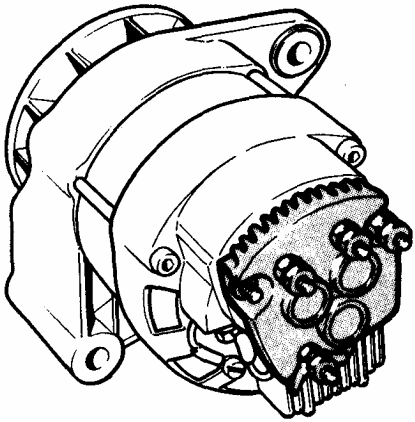
The engine is equipped with an alternator. To ensure that the alternator, with the builton regulator, functions without interruptions, the following important points must be observed:

1. **The main switch must never be switched off until the engine has stopped.**

Otherwise would ruin the charging regulator

2. **The battery connection poles must never be mixed up.** A plus sign and a minus sign are marked on the respective poles. The minus pole is connected greased and well tightened.

3. Re wiring between the charging circuits may not be carried out while the engine is running.



Fit a Volvo Penta charging distributor (accessory) on the alternator when more than one battery is connected.

4. Observe the following whenever the engine is started with an auxiliary battery:

Let the ordinary battery remain connected up. Connect the auxiliary battery to the ordinary battery, plus to plus and minus to minus. When the engine has started, remove the auxiliary battery, but do not break the ordinary battery's wiring circuit.

5. Do not use a rapid charging unit when the alternator is connected to the battery.

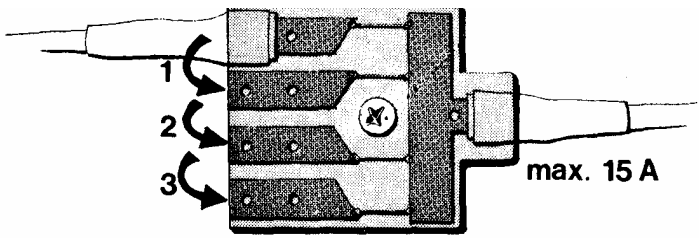
6. Disconnect both the battery cables before doing any work on the alternator equipment.

7. When electrical welding work is done to the engine or installation components, disconnect the charging regulator cables at the alternator and insulate the cable ends.

8. Check regularly the belt tension and the cable connections.

Changing the fuse

A fusebox is mounted on the cylinder. A fuse breaks the electrical system when overloaded. Re-connect the electrical system by transferring the cable connection to the next fuse contact.



Starter motor and alternator

All work connected with the starter motor and alternator should be done by an authorized service shop.

Inspection and control should be carried out in connection with a general inspection of the engine.

CHECKS AND SERVICE

BATTERY

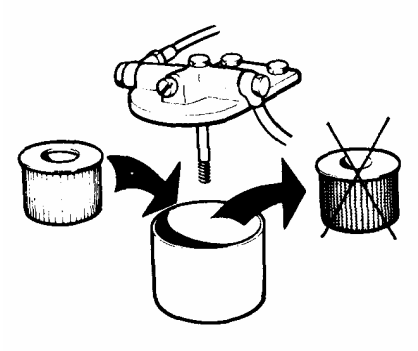
Checking the state of the battery charge

The charging of the battery should be checked at least once each season. This is done by using a hydrometer, which shows the specific gravity of the electrolyte, this varying with the state of the charge. (see "Technical Data").

FUEL SYSTEM

Observe the greatest cleanliness when handling the fuel system. IMPORTANT: Try to avoid fuel splash.

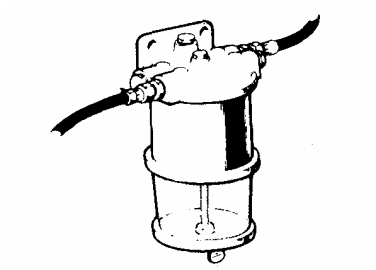
Changing fuel filter



The filter element in the fuel filter should be changed at least once each season.

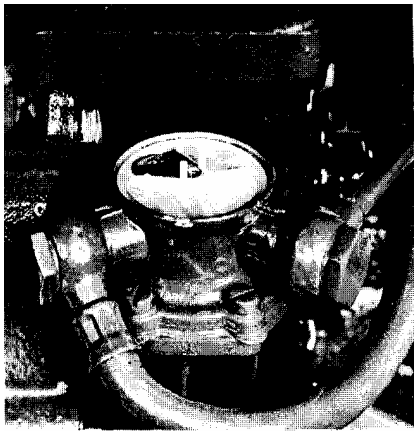
To do this, remove the filter centre screw and remove the container with the filter. Try to avoid fuel splash. Clean the container and contact surfaces, and fit a new filter element and its gasket. Pump up the fuel with the hand primer. If the pump action is poor; turn the engine so that the cam driving the pump changes position. Vent the fuel system. (See page 21).

Extra fuel filter



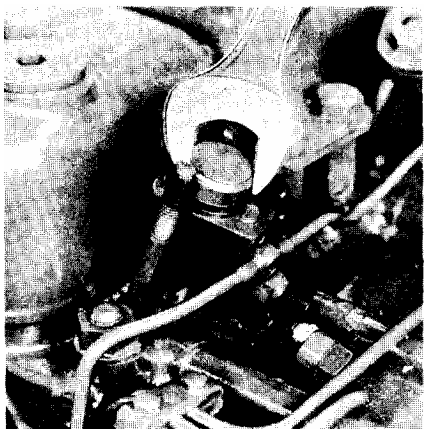
If an extra fuel filter with water separator is fitted, check the transparent bowl to see if there is any water in the fuel. If necessary, drain the filter via the cock in the bottom of the bowl. Try to avoid fuel splash. Pump up the fuel and vent the system. The fuel filter element should be changed at least once each season.

Fuel strainer



The fuel pump on the engine has a built-in strainer, which can be removed by removing the pump's cover. The strainer must be cleaned at least once per season. Always vent the fuel system. Refer to "Venting of Fuel System" (page 21). **Check immediately after starting that there is no fuel leakage.**

Injectors



The injectors should be removed once a season and taken to a diesel shop for cleaning and checking of the spray pattern, opening pressure and for leakage. Unscrew the delivery pipe and return pipe from the injector. Fit protective caps. Loosen the injector's retainer and lift out the injector. If the injector feels stiff due to carbon buildup, grip it with e.g. polygrip pliers and carefully rotate it back and forth while levering it up at the same time (with a screwdriver under the fork), When fitting, check that the contact surfaces between the injector and the copper sleeve are clean. Refit and tighten the delivery pipe and return pipe on the injector. Make sure the cones are properly located. Retighten both the nuts holding the fork alternatively. For the correct torque, refer to "Technical Data". Start engine and check for any leakage. If the delivery pipe has been completely removed, vent as set out in point 4, page 2 1, to facilitate starting.

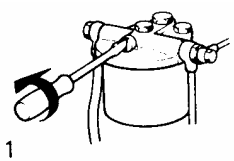
CHECKS AND SERVICE

Venting of the fuel system

To enable the engine to start, the fuel system must be vented after carrying out the following:

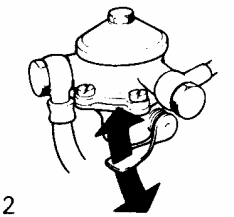
Change of fine filter After cleaning the feed pump strainer In the fuel tank has been run empty When fitting an injection pump If leakage or work has been carried out on fuel pipes After long laying up periods

Venting is carried out as follows: (Regarding location, refer to Engine Component Guide)



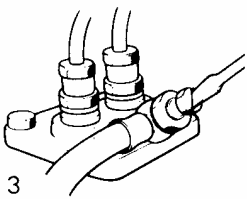
1

Open venting screw on the fuel filter about 4 turns. Be observant for fuel leakage.



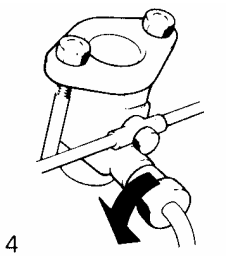
2

Pump up the fuel by using the hand primer until fuel, free from air bubbles flows out. Close venting screw. If the pump action is poor, turn the engine so that the cam driving the pump changes position.



3

If the injection pump has been removed, or when first starting a new engine, the injection pump must be vented. Open the venting screw on the injection pump about 2 turns. Pump the hand primer until fuel free from air bubbles flows out. Close the venting screw.



4

Loosen the injector's delivery pipe nut, push in the stop control and put the engine speed control in the full speed position. Press down the cold start button (M D 11 C only). Turn the engine by using the starter motor until fuel flows out from the delivery pipes. Retighten the delivery pipe nut and start the engine.

SERVICE IN CONNECTION WITH LAYING-UP AND LAUNCHING THE BOAT

INHIBITING ENGINE AND REVERSE GEAR

IDLE ENGINE FOR BRIEF PERIODS WITH BOAT IN WATER

To prevent the engine from corrosion attacks, it must be run warm at least once every 14 days as long as the boat is in the water. If it is anticipated that the boat will not be used for more than a month, long-term inhibiting should be carried out.

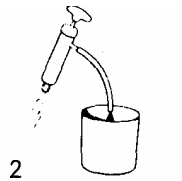
INHIBITING FOR A LONG PERIOD

An authorized service shop should test the engine and equipment before inhibiting the engine for a long period according to Inhibiting Schemes I and II. It is advisable to test the compression to find out the condition of the engine.

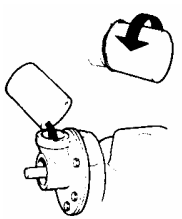
INHIBITING SCHEME **Carried out with boat in water**


1

Run the engine warm


2

Pump out all the oil from the engine and reverse gear
Use an oil scavenging pump


3

Change the oil filter. Fill the engine and reverse gear to the correct level with Volvo Penta diesel engine oil, which also has rustproof ing properties. The engine is thereafter ready for operation with this oil for the next season.

For long-term inhibiting, exceeding the normal winter lay-up period, preservative oil should be used. This should be of the type Esso Rustban 623, Shell Ensis oil or corresponding oil. In this case, the oil filter shall not be replaced until launching.

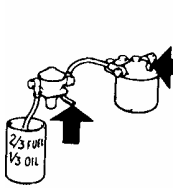

4

Drain the fuel filter and refit the holder with filter. If an extra fuel filter with water separator is fitted, drain if there is any water in the fuel.

LAYING-UP AND LAUNCHING

INHIBITING SCHEME II

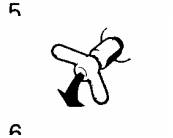
Carried out with the boat on land



5

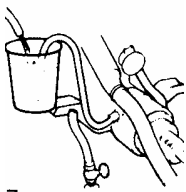
Disconnect the fuel pump's flexible suction hose from the fuel system and insert the free end in a can filled with 1/3 Volvo Penta diesel engine oil or preservative oil, and 2/3 diesel fuel oil. Vent the fuel system (see page 21).

NOTE. If the fuel system has an electrically operated fuel pump, it must be switched off.



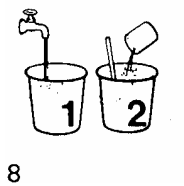
6

Drain the cooling water from the engine and reverse gear (pos 14 and 10, pages 31-32). Check to make sure that the water runs out, as impurities can block the cock. Then close all cocks and re-fit the drain, cock in the reverse gear.



7

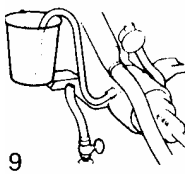
Disconnect the reverse gear suction line from the reverse gear. Connect a hose with an inner diameter of 1/2" and insert the free hose end into a container with fresh water. Arrange to have water added to the container. Run the engine at idle for about 5- 10 minutes, so that it is flushed throughout with fresh water. At the same time the fuel system will be inhibited. Check that nothing is splashed near the exhaust outlet. Drain all water from the engine and reverse gear. Then close all drain points.



8

Mix a rustproofing mixture consisting of 10 1(9 Imp. qts = 10,5 US qts) and 1 1 (1.8 Imp. qts = 2.1 US qts) rustproofing oil of the emulsifying type. NOTE: Water first and then the oil.

Use, e.g. Esso Cutwell 40, Shell Donax C or similar. As an alternative, a freeze-resistant 30 % glycol mixture can be used.

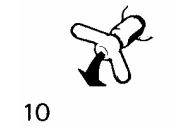


9

Insert the hose into the rustproofing mixture. Start the engine and let it run at idle until the mixture is finished. NOTE. The water Pump must never be allowed to run dry.

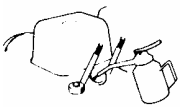
Connect the fuel pump's flexible suction hose to the fuel system pipe.

LAYING-UP AND LAUNCHING



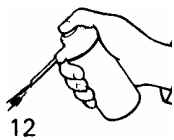
10

Since the rustproofing mixture does not provide any protection against freezing, it must be drained from the engine and reverse gear (pos 14 and 10, pages 31-32). Remove the cover from the cooling water pump. Check to make sure the impeller is in good condition. NOTE. Do not pull out the impeller if it is in good condition.



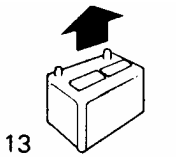
11

Remove the injector and hand it in to a diesel shop for cleaning and checking. Inject Volvo Penta oil into the cylinders. Turn round the engine several turns with the starter motor or the crank. NOTE. Prevent oil splash. Re-fit the checked injectors, but without tightening them altogether. They are to be removed again before launching.



12

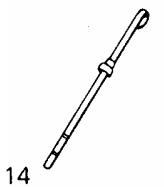
Clean the outside of engine and reverse gear. Touch in any bare patches in the paintwork with the original type of paint. Spray the components of the electrical system, and all the controls with anti-moisture spray.



13

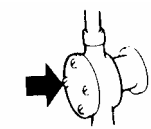
Remove the battery. It needs to be charged to prevent it from being damaged.

SERVICE IN CONNECTION WITH LAUNCHING



14

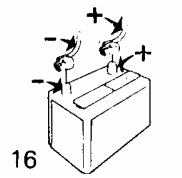
If Volvo Penta diesel engine oil has been used, you only need to check the oil level in the engine and reverse gear.



15

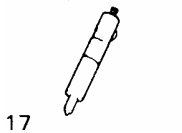
If preservative oil has been used, both the oil and the filter must be replaced. See under "Service after every 50 hours of operation".
Screw tight the cover with its gasket on the cooling water pump. Connect the hose between the cooling water intake and the reverse gear.
Check that all hose clamps are tightened. Close the drain cocks.
Clean the outside of engine and reverse gear.

LAYING-UP LAUNCHING



16

Install the battery, which should be fully charged. Grease the cable shoes. Connect the battery cables. **IMPORTANT.** Do **(not)** reverse the polarity. Tighten the cable shoes well.


17

Remove the injectors. Take measure to avoid oil splash and run the engine several turns so that the oil on the piston crowns is blow out.
Refit the injectors. See "Tightening torques", "Technical Data".


18

Change the fuel filter cartridge. Pump forward the fuel and vent the system. See "Venting the fuel system" (page 21).


19

Launch the boat. Start the engine. See the instructions on page 5. Run the engine warm with the reverse gear engaged. Check to make sure there is no leakage of fuel, air, water or exhaust gases. Check that all the controls, etc., are functioning properly.

20

When necessary, contact an authorized Volvo Penta Service Shop, and let them service the engine and reverse gear according to the instructions in the servicing scheme.

FAULT FINDING SCHEME

TRACING FAULTS WITH INTERRUPTIONS IN OPERATION

The fault tracing scheme given below lists only the most usual of faults that give rise to interruptions in operation. With the help of the instructions given in this handbook, the owner can generally remedy most of the faults listed below. When in doubt, always contact the nearest Volvo Penta workshop.

Follow the maintenance scheme's recommendations - it helps provide trouble-free operation

Engine does not start	Engine stops	Engine does not reach correct speed at full throttle	Engine Runs Unevenly or vibrates abnormally	Engine becomes abnormally hot	**REASON**	See
?					Main switch not switched on, flat battery, open circuit in electric cables or blown fuse	pp 5, 13 17, 18
?	?				Empty fuel tank, closed fuel cock, blocked fuel filter	pp 19, 20, 21
?	?				Water, air or impurities in fuel	pp 19, 20, 21
	?	?	?		Defective injector	pp 20
	?		?		Idling speed incorrectly adjusted	pp 27
		?			Boat overloaded	pp 3
		?			Marine growth on hull	pp 3
			?		Damaged propeller	
				?	Blockage in cooling water intake, cooling jackets, defective impeller or thermostat	pp 16, 17

TECHNICAL DATA

Technical data

General

Engine designation	MD11C	MD17C
Number of cylinders	2	3
Propeller shaft output kW (hp) at 41.7 r/s (2500 rpm)	17 (23)	25 (35)
Max operating speed rev/sec (rpm)	41.7 (2500)	
Cylinder diameter, mm (inches)	88,9 (3,5)	
Stroke, mm (inches)	90,0(3,55)	
Displacement, dm^3 (in^3)	1,12 (68,3)	1,68 (102,4)
Compression pressure kp/cm^3 (psi) (starter motor speed)	20-24 (144-173)	
Idling speed r/s (rpm)	11-13 (650-780)	
Direction of rotation looking at flywheel	Clockwise	
Max rearwards inclination, boat underway	15°	
Max sideways inclination, boat underway	15°	
Engine weight, incl. reverse gear, kg (lbs)	230 (505)	290(640)

Valves

Valve clearance, hot engine		
inlet, mm (in.)	0,30 (0.012)	
exhaust mm (in.)	0,35 (0.014)	
Decompression device, max downwards movement of exhaust valve, mm (in.)	0,5 (0,0197)	

Lubrication system

Engine

Oil capacity dm3 (imp qts=US qts) excl. filter	2,6(2,2=2,7)	4,2(3,6=4,4)
incl. filter	2,9 (2,5=3,05)	4,5 (3,8=4,7)
Oil quality	Diesel lubricating oil CD	
Viscosity		
above +10C (50F)	SAE 20^2	
below +10C (50F)	SAE $10W3^0$	
Oil pressure, hot engine, idling speed kp/cm^2 (psi)	0,8-1,5 (11,2-21)	
at full speed kp/cm^2 (psi)	2,0-3,0 (28-42)	

MSB reverse gear with reduction

Oil capacity, dm^3 (Imp qts=US qts)	0,60 (0,5-0,6)	
Oil quality (same as for engine)	Diesel lubricating oil CD	
Viscosity		
above + 1° C (50°F)	SAE 20^2	
below +10° C (50°F)	SAE $1OW^3$	

Cooling system

Thermostat, starts opening at °C (°F)	60° (140°)	57° (135°)
fully open at °C (°F) 1	75° (168°)	72° (160°)

1)Propeller shaft output according to DIN Lesitung B fur Dauerbetrieb.
2) Volvo Penta CID oil, Double grade.
3) Volvo Penta CD oil, Single grade.

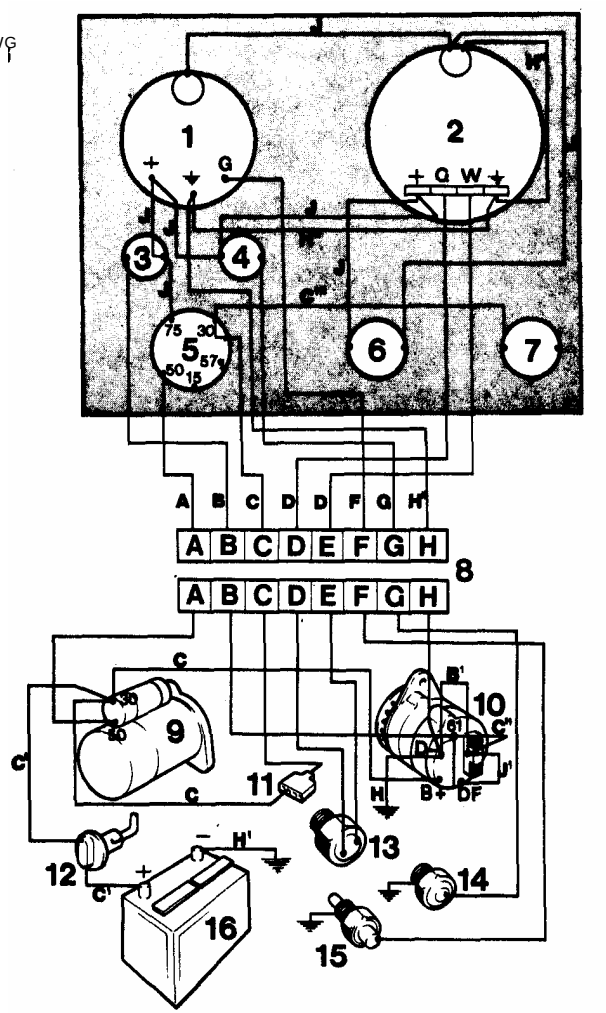
TECHNICAL DATA

Fuel system	
Injection pump, make Bosch, MD1 1 C	PRF 2K 75A 407/11
MD17C	PRF 3K 75A 408/11
Feed pressure, kp/cm^2 (psi)	0,75 (11)
Injector, make Bosch, holder	KBL 87S78/4
nozzle ..... ""	DLLA 150S720
opening pressure kp/CM^2 (psi)	170-178 (2418-2531)
Pre-injection angle, crankshaft degrees B.T.D.C .	23°-26°
Reverse gear	
Type	Volvo Penta MSB
Ratio with reduction gear	1,91:1
Electrical system	
Battery voltage, volt	12
Battery capacity, max Ah	150
Starter motor rating kW (Ah)	1,5 (2)
Alternator rating W (A)	35 (420)
Battery electrolyte spec.grav.	
Charging to be carried out at g/cm^3	1,230
Fully charged battery g/cm^3	1,275-1,285
Torques	
Cylinder head bolts	
kpm (lbf) (spanner width 19 mm)	11,0 (79)
kpm (lbf) (spanner width 15 mm)	4,5 (32)
Connecting rod bolts, kpm (lbft)	6,5 (46)
Crankshaft main bearing (centre bearing) kpm (lbft)	8,0 (58)
Injectors nuts, kpm (lbft)	2,0 (14)

WIRING DIAGRAM

Cable colour code

Mark.	Colour	MM2	AWG
A	White	6	9
8	Black	1,5	15
B	Black	0,6	19
C	Red	6	9
C'	Red	35	1
C"	Red	0,6	19
C' "	Red	2,5	13
D	Grey	1,5	15
F	Yellow	1,5	15
G	Brown	1,5	15
H	Blue	4	11
H'	Blue	35	1
H"	Blue	1,5	15
J	Green	1,5	15
J'	Green	0,6	19



List of components

1 Temperature gauge
2. Rev counter
3. Battery charging warning lamp
4. Low oil pressure warning lamp
5. Key switch
6. Switch, instrument panel illumination
7. Switch, extra equipment
8. Connector
9. Starter motor
10. Alternator
11. Fuse box
12. Main switch
13. Sender, rev counter
14. Sender, oil pressure
15. Sender, temp gauge
16. Battery

ON BOARD DATA

LOA m (ft.). Beam = m (ft.). Draught m ft.). Height above waterlines m ft.). Displacement = Fuel tank cap. = l Imp.gals. = US gals.). Water tank = l Imp.gals. = US gals.). Battery cap., std. circuits

Ah. Battery cap., opt. equipment circuit Ah.

The light bulbs have the following wattage:

Instruments: W. Cabin: W. Pentry: W.Toi

let: W. Compass: W. Ports. Starboard lights: W. Stern lights: W. Masthead lights: W. Searchlight: W.

Cockpit: W.

The tool kit and the spare parts kit contain the following:

. .....

. .....

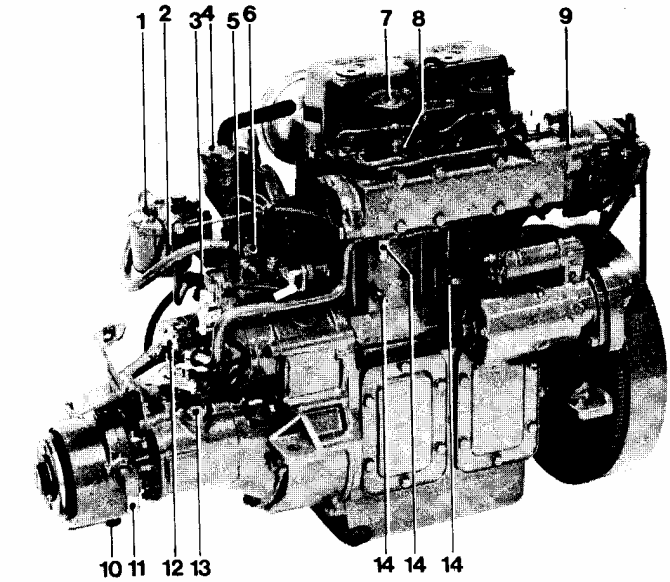
. .....

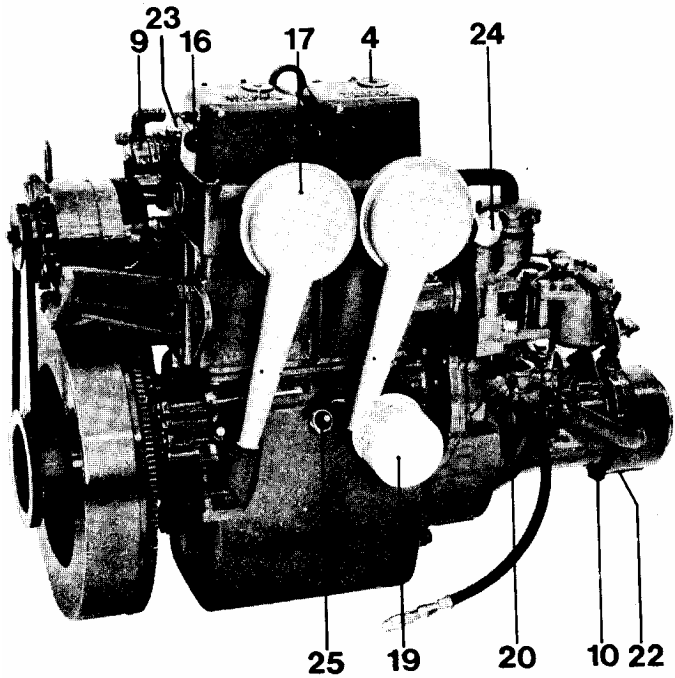
. .....

CHECKS AND SERVICE HAVE BEEN CARRIED OUT AS FOLLOWS:

50 **hour intervalts**			100 hour intervals		
dat	/	by	dat	/	by
dat	/	by	dat	/	by
dat	/	by	dat	/	by
dat	/	by	dat	/	by
dat	/	by	dat	/	by
dat	/	by	dat	/	by
dat	/	by	dat	/	by
dat	/	by	dat	/	by
dat	/	by	dat	/	by
dat	/	by	dat	/	by

ENGINE COMPONENT GUIDE
MD 11 C, Reverse gear MSB

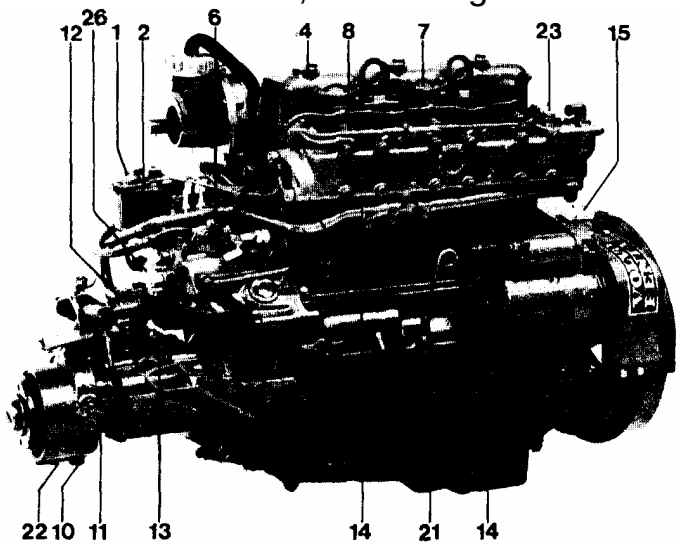


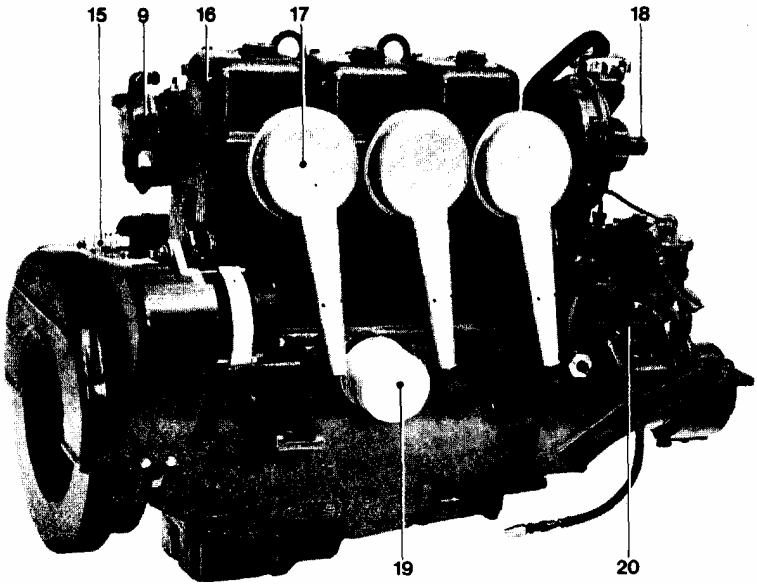


1. Venting screw, fine filter
2. Fine filter
3. Fuel pump
4. Oil filler, engine
5. Cold start button (MD 11 C)
6. Venting screw, injection pump
7. Injector
8. Injector pipe nut
9. Thermostat housing
10. Cooling water drain plug, reverse gear
11. Cooling water inlet
12. Cooling water pump cover
13. Oil dipstick and oil filler reverse gear
14. Cooling water drain cocks for engine (3 on MD11C, 4 on MD17C
15. Fuse box
16. Decompression lever
17. Air filter and inlet silencer
18. Hand starter (not standard on MD17C)
19. Oil filter
20. Fuel pump (with hand primer)
21. Oil dipstick, engine
22. Oil drain plug, reverse gear
23. Sender, temperature meter
24. Sender, rev counter
25. Sender, low oil pressure
26. Stop device

ENGINE COMPONENT GUIDE

MD17C, Reverse gear MSB

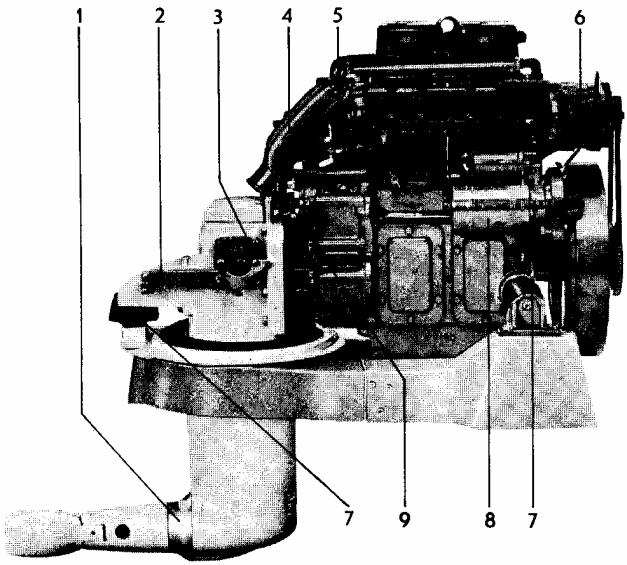




For position explanation, refer to page 31

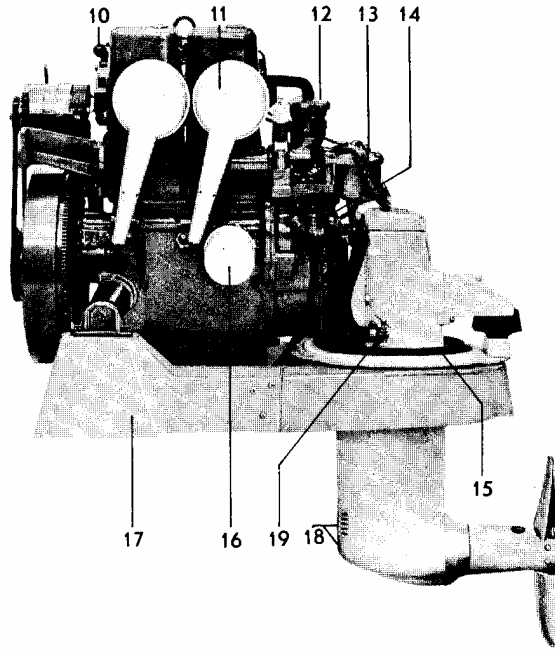
ENGINE COMPONENT GUIDE

MD11C/110S



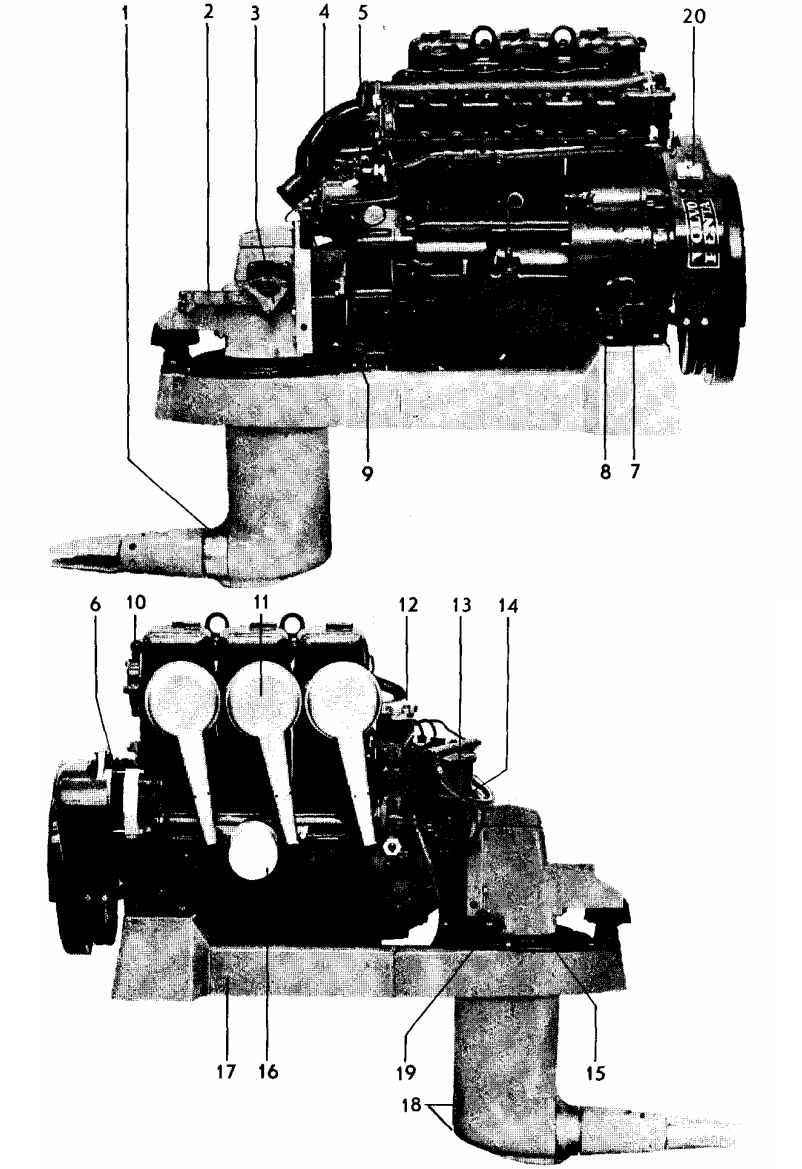
1. Zinc anode
2. Bracket for control cable
3. Lever for gear change
4. Water cooled exhaust elbow
5. Injection pump
6. Alternator
7. Rubber engine suspension
8. Starter motor
9. Sea water pump
10. Decompression handle
11. Air filter with inlet silencer
12. Oil filler

13. Fuel filter
14. Fuel pump
15. Seal between bed and drive
16. Oil filter
17. Engine bed
18. Cooling water intakes
19. Cock for incoming cooling water
20. Fuse box



ENGINE COMPONENT GUIDE

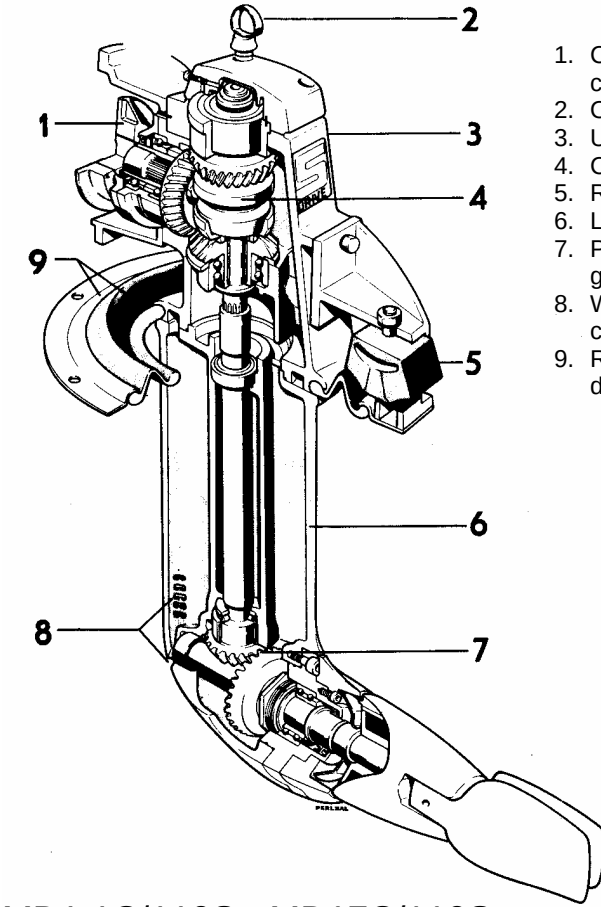
MD17C/110S



For position explanation refer to page 33

TECHNICAL DESCRIPTION

S-drive 11 0S



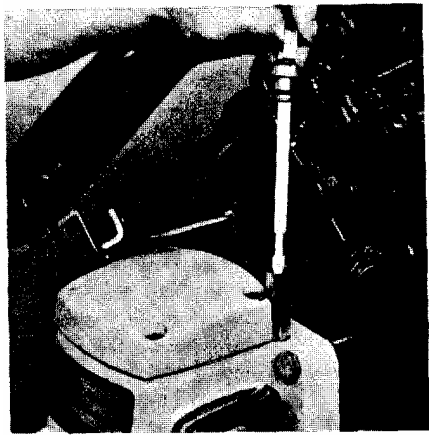
1. Coupling claw with rubber coupling
2. Oil dipstick
3. Upper gear housing
4. Clutch cone, silent shift
5. Rubber suspension
6. Lower gear housing
7. Propeller shaft with helical gears
8. Water intake for engines cooling system
9. Rubber membrane between drive and hull

MD1 1C/110S - MD17C/110S

The following supplementary instructions cover the description and maintenance of the S-drive 11 0S also the equipment components and data which differ between the reverse gear equipped engine and the engine equipped with the sailboats drive.

For maintenance and description of the engine, the previous information should be followed.

CHECKS AND SERVICE

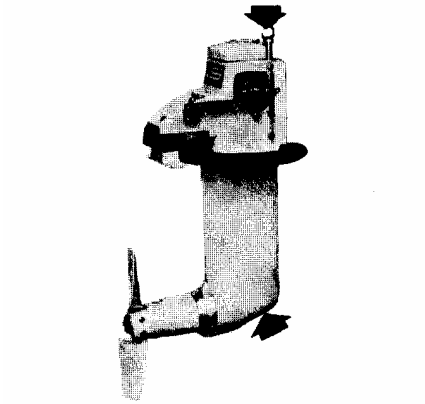


OIL LEVEL IN DRIVE

Check every 14 days that the oil level is within the dipstick's markings.

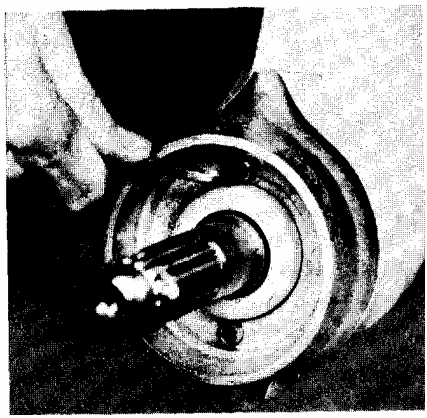
The oil dipstick has a bajonet fitting, therefore it must be turned when lifting and replacing. Note the sealing ring on the dipstick. When checking the oil level the dipstick must be turned to the locked position.

Oil filling is done through the hole for the dipstick. NOTE. Do not overfill. **Regarding** choice of oil, refer to "Technical Data" page 37.



CHANGING DRIVE'S OIL

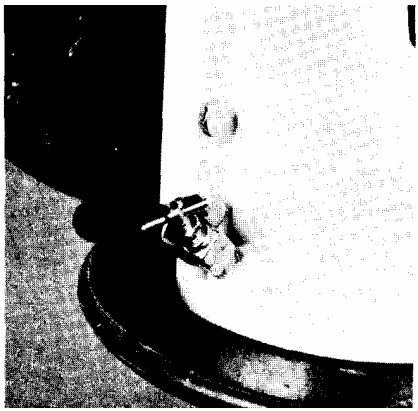
Remove the oil dipstick. Unscrew the drain plug under the propeller gear housing and let the oil drain off. Refit the drain plug together with 0-ring. Fill with oil through the dipstick's hole. NOTE. Do not overfill. Regarding choice of oil, refer to "Technical Data" page 37.



ZINC ANODE

Change the zinc anode if it has corroded by more than 50 %. Remove the propeller and spacer ring together with the deflector and remove the two allen screws holding the zinc anode. Scrape the contact surface of the drive and fit a new zinc anode. Make sure that there is a good metallic contact between the zinc anode and the drive. NOTE. The zinc anode must not be painted.

CHECKS AND SERVICE



COOLING SYSTEM

The cooling water intake for the engine's cooling is located in the drives' lower gear housing. Check when the boat is taken up on land, that the grill and the round hole on the front of the drive is free from marine growth. If there is a danger of freezing and when inhibiting, the cooling water is drained from the drive and the pump by the cock on the drive. **NOTE. When draining while the boat is still afloat, the cock must be first closed.** Do not forget to open the cock before the engine is restarted.

GENERAL MAINTENANCE

While the boat is ashore, check the drive's paintwork and if necessary touch it with genuine Volvo Penta paint. Paint the drive with anti-fouling paint which does not contain copper. Check from outside that the rubber membrane over the drive's hull aperture is in place.

Check from inside that the rubber seal between the bed and the drive is not damaged. A damaged seal must be replaced.

RUNNING Important!

When charging from engine power to sail the propeller's rotation is stopped by engaging reverse. During sailing the control shall be in the Neutral or Reverse position, if a folding propeller is used. The control shall be in the Neutral position if a fixed propeller is fitted.

TECHNICAL DATA, S-drive 1 10S

Sailboats drive, type .....I 110S
Ratio 1.66:1
Oil capacity, sailboat drive, dm3 (Imp qts = US qts) 1,8 (1,62-1,9)

Oil quality (same as engine) .....Diesel lubricating oil CD
Viscosity ..... SAE 20W[1)]
Total weight, MD11C/110S kg (lbs) 247 (545)
MD17C/110S kg (lbs) 317 (695)

1) Volvo Penta CD oil, Double grade

ALPHABETICAL INDEX

Alternator 17, 18
Battery 13, 19
Belt tensioning 13, 16
Charging regulator 7, 18
Check and service sheme 11
Controls 2
Cooling system 9, 16
Cylinder head bolts 16
Decompression levers 31, 3
De-inhibiting 24
Drain cocks 31, 32
Electrical system 8, 17, 29
Engine assembly 8
Engine component guide 31-34
Engine speed 3
Fault tracing scheme 26
Fine filter 19, 21, 31
Fuel 3
Fuel filters 19
Fuel pump 20
Fuse box 18
Hand primer 20, 31, 32
Hand starter 5
Impeller 17
Inhibiting 22-25
Injectors - 20
Instruments 2
Launching 2
Lubricating oil
Lubrication system
Main switch 5, 1
Oil change 13, 1
Oil dlipstick engine 1
Oil dipstick, reverse gear 1
Oil filter 1
Oil level check 1
Preparations before starting
Reserve battery 1
Reverse gear
Running
Safety equipment
Sail drive 110S 37-3
Sea water pump 1
Starter motor 1
Starting
Technical data 27, 2
Thermostat 31, 3
Valve clearances 1
Venting the fuel system 2
Wiring diagrams 2

NOTES

Publ, no 3386
10. 77

VOLVO PENTA

Supplement to instruction book MD5A, MD7A, MD1 1C, MD17C

Folding propellers are being used more and more on sailboats. There are several makes to choose from for conventional installation.

The most important advantage with a folding propeller is that it gives less current resistance during sailing but when the engine is running it has a somewhat lower effect especially when manoeuvering astern.

If the boat is supplied with a folding propeller it is important to know about and observe the following:

Putting in "FORWARD" should take place during idling. Changing at higher r.p.m. can damage the propeller because of the great stress resulting when the blades are folded out.

When the boat is to be laid up the propeller should be treated as follows:

Clean the propeller with fresh water, remove the screws for the propeller blades' suspension pins, take away the pins and the blades. Clean all surfaces and then lubricate all the propeller parts with grease. Take special care with the bearing surfaces on pins and blades. Protect the propeller boss.

When launching:

Fit the propeller together, wipe off superfluous grease and check that the blades fold inwards and outwards easily.

NOTES

Personal details

Name .....

Address .....

Telephone …..……..…….....

Nearest Volvo Penta service workshop

Name .....

Address .....

Telephone .....

Engine details

Engine type .....

Engine no . .....

Reverse gear type ….....Ratio ……

Reverse gear, or S-drive, serial no .....

Propellersize .....

Publ. No. 3167
July 1976

AB VOLVO PENTA,
S-405 08 GOTHENBURG SWEDEN